BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

EXHIBIT
/

COMPENDIUM OF INDIAN MEDICINAL PLANTS

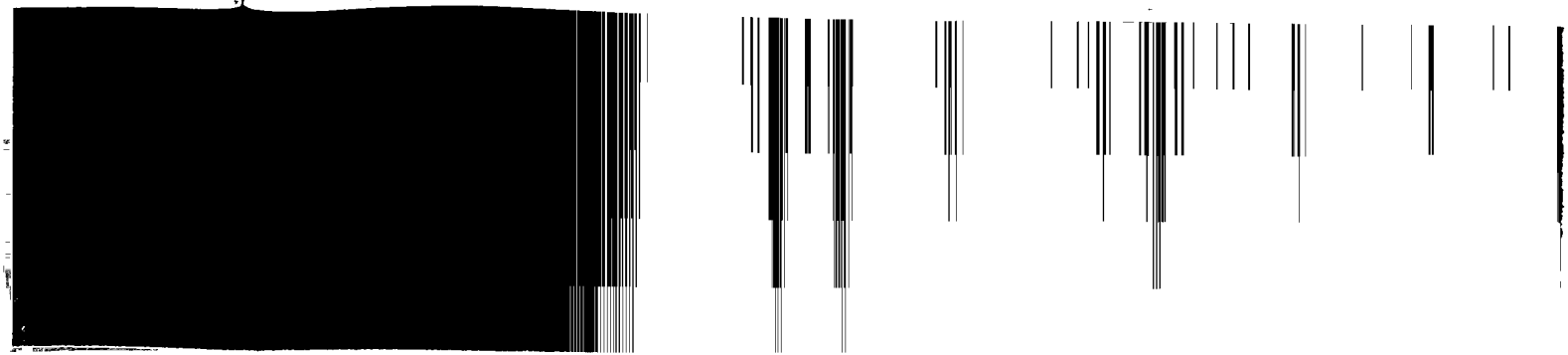
Ram P. Rastogi
B.N. Mehrotra

VOLUME 5
1990-1994

Central Drug Research Institute
Lucknow
and
National Institute of Science Communication
New Delhi
1998

DRUG RESEARCH PERSPECTIVES : A CDRI SERIES

COMPENDIUM OF INDIAN MEDICINAL PLANTS
VOL. 5
1990-94



COMPENDIUM OF INDIAN MEDICINAL PLANTS VOLUME 5 1990-1994

Editor

Ram P. Rastogi

Authors

Ram P. Rastogi
Former Dy. Director
and
Emeritus Scientist

B.N. Mehrotra
Former Dy. Director,
Central Drug Research Institute,
Lucknow.

with technical assistance of

Shradha Sinha **Mukta Srivastava** **Bela Bhushan**

Central Drug Research Institute, Lucknow
&
National Institute of Science Communication, New Delhi

ISBN 81-85042-14-4

Cataloguing-in-Publicati n Data
Compendium of Indian Medicinal Plants, Vol. 5, 1990-1994
Drug Research Perspectives : A CDRI Series
Indian Medicinal Plants, Ram P. Rastogi
DNLM : 1. Indian Medicinal Plants 2. Distribution 3. Medicinal uses
4. Chemical constituents 5. Biological activities.

1998

*Photocomposition by **M/s. KANAL COMPUTERS**, LIG-1, LDA Colony, Aishbagh, Lucknow, and printed at the **Printing Unit of the National Institute of Science Communication**, Council of Scientific and Industrial Research, New Delhi.*

Indian libraries and some journals have stopped publication or have changed their names, cross-references to Chemical Abstracts have been given in such cases.

BOTANICAL NOMENCLATURE

Since the nomenclature of many plants has undergone revision in the preceding decades, the names of plants, including those given in the Glossary and in the cited references, have been updated as far as possible to provide currently accepted names. In cases of change of name, the obsolete names have been given as synonyms according to the following order: the currently accepted name is followed by the name given the Glossary and then by the corresponding name listed in Hooker's *Flora of British India* or other subsequent relevant literature as addition to Indian flora (if it is different from the name listed in the Glossary), and finally by the title name of the plant given in the reference cited, if it is different from the earlier mentioned names. Similarly, the names of the natural orders (families) have also been revised whereas required according to the currently accepted pattern.

There is divergence of opinion among Indian botanists on the merits of maintaining or splitting of a few large genera like *Bauhinia*, *Euphorbia* and *Pylygonum*. In this Compendium, therefore, their existing generic status has been maintained.

The plant names mentioned under synonymy, in case of name change, have been incorporated in the text in their alphabetical order and cross references to their currently accepted names have been given to facilitate search for any particular plant on which information may be required.

INDEXES

Besides indexes of local names and of chemical substances isolated, two additional indexes namely biological activities and chemical structures, were provided in preceding volumes 1, 2, 3 and 4 to enhance the usefulness of the Compendium to all classes of readers. It may be mentioned that the indexes of chemical structures pertaining to Vols. 1 and 2 were compiled and given as addenda in reprint editions of these volumes. Thus, all the volumes contain four indexes each.

EXPLANATORY INTRODUCTION

SCOPE

This Compendium has been designed as a companion volume to the Glossary of Indian Medicinal Plants by Chopra, Nayar & Chopra (hereinafter reffered to as Glossary). All the plants have been listed in alphabetical order and reference to the Glossary has been given for those plants which are included therein; in the case of new plants, not listed in the Glossary, their local name and distribution has also been included, wherever known, in keeping with the pattern of the Glossary. The distributional range of such plants has been confined to the present political boundary of India. Bhutan and Nepal have also been included because these countries fall within the unbroken chain of the Himalayas and some of the Himalayan species occur in contiguous territories In India, Bhutan and Nepal. Certain plants, although not found in India, are included either because these were listed in the Glossary or are sold in the indigenous drug market in India.

The literature cited is on the basis of complete screening of Chemical Abstracts and Biological Abstracts and covers the five-year period from 1990 to 1994. It has been aimed to make the Compendium exhaustive by including research done anywhere in the world on the taxa found in India, whether indigenous or introduced.

LITERATURE CITATION

The abbreviation of the reference citations are in accordance with the practice followed in **Chemical Abstracts and Serial Sources for the Biosis Data Base, Volume 1985**. Since many journals, especially those published in Latin American, African and South-east Asian countries, are not available in most

In the index of chemical compounds trivial names have been used, wherever given, and no attempt has been made to include systematic names. Synonyms, as far as they have come to our knowledge, have been included in the index via "see". Substances not named by their discoverers have been listed simply by plant origin, e.g. 'Aesculus triterpene glycoside'. Since the list contained about 12,300 entries, help of computer has been taken to prepare the alphabetical list. A suitable computer programme has been developed for this purpose. Thus, the name of the compound is arbitarily divided into 3 components - the basic name, the prefixes such as (+), (-), D, L, cis, trans, α, β etc. and the substituents. Each substance has been indexed as far as possible under its basic name. For example: d-α-cadinene is indexed as cadinene, d-alpha-; O-demethyl-β-lumicolchicine as lumicolchicine, beta-, O-demethyl; 2-methyl-5-methoxy-1,4-napthoquinone as naphtho-quinone, 1,4-,2-methyl-5-methoxy.

SPECIAL FEATURES

In view of the fact that since 1960 researches on plants, both from the chemical and biological aspects, have been much more exhaustive than earlier, the pattern of the write-up on each plant has been suitably modified to include the new type of data/information. Besides summarising the results of biological evaluation of total extracts and fractions thereof and of chemical studies, each write-up has two new sections wherever necessary. A section on 'Biological Activity' gives a summary of all the pharmacological, biological and clinical work done on the pure constituents obtained from a plant. Similarly, a section on 'New Compounds' gives the complete structures of new substances isolated. It is hoped that these two new sections would add immensely to the usefulness of the Compendium by highlighting the results of chemical and biological studies on each plant in a systematic manner.

Central Drug Research Institute
Lucknow
February, 1998

Ram P. Rastogi
B.N. Mehrotra

Compendium of Indian Medicinal Plants
Vol. 5

ABELMOSCHUS (Malvaceae)

A. moschatus Medik. syn. *Hibiscus abelmoschus* L. (*Compend. Indian Med. Plants*, Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p.1).

Trans-2-trans-b-farnesyl acetate (64.22) and ambrettolide (14.96%) determined in seed essential oil by GC-MS (*Yunnan Zhiwu Yanjiu* 1990, *12*, 113; *Chem. Abstr.* 1990, *113*, 120594 v); stereoselective synthesis of farnesol (*J. Korean Chem. Soc.* 1992, *36*, 579; *Chem. Abstr.* 1992, *117*, 192097 r).

ABIES (Pinaceae)

A. excelsa DC.; see *Picea abies* (L.) Karst.

A. spectabilis (D.Don) Mirb. syn. *A. webbiana* Lindl. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p.1).

Bornyl acetate (15.5,4.2), camphene (9.3,3.5), carvone (0.75,5.8), limonene (2.3,6.1), α-pinene (10.3,3.0) and β-pinene (3.3,5.1) determined in volatile oils of needles and twigs respectively collected from Kalinchok and Rasuwa Himalayan regions of Nepal by GC-MS (*J. Nepal Chem. Soc.* 1991, *10*, 20; *Chem. Abstr.* 1992, *117*, 23934 r).

A. webbiana Lindl.; see *A. spectabilis* (D.Don) Mirb.

ABROMA (AMBROMA) (Sterculiaceae)

A. augusta (L.) L.f. (*Compend. Indian Med. Plants*, Vol. 2, Rastogi & Mahrotra, PID, New Delhi, 1991, p.1).

Taraxerol, its acetate and lupeol isolated from leaves (*J. Inst. Chemists*, Calcutta 1992, *64*, 229; *Chem. Abstr.* 1993, *119*, 266502 j); maslinic acid and α-amyrin isolated from root bark; protocatechuic, vanillic and caffeic acids in their free, glycosidic and ester forms identified in root bark extract (*Dhaka Univ. Stud.* 1993, *41*B, 119; *Chem. Abstr.* 1994, *120*, 4566 h); a water-soluble polysaccharide fraction isolated from root bark and found to contain rhamnose, arabinose, xylose, mannose, galactose, glucose, galacturonic acid and glucuronic acid (*Indian J. Chem.* 1994, *33*B, 509); an acidic polysaccharide containing rhamnose, galacturonic acid and glucuronic acid isolated from root bark and partially characterised (*Carbohydr. Polym.* 1994, *24*, 277; *Chem. Abstr.* 1994, *121*, 276760 x).

ABRUS (Papilionaceae)

A. fruticulosus Wall. ex Wt. & Arn.

ADHATODA (Acanthaceae)

A. vasica Nees; see *A. zeylanica* Medik.

A. zeylanica Medik. syn. *A. vasica* Nees (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehotra, PID, New Delhi, 1995, p. 13).

Lignins composed of guaiacyl-, syringyl- and p-hydroxyphenyl-propane building units yielded vanillin, syringaldehyde and p-hydroxybenzaldehyde (*Himalayan Chem. Pharm. Bull.* 1989, *6*, 45; *Chem. Abstr.* 1990, *112*, 52307 f); vasicinol, vasicinone, deoxyvasicinone, deoxyvasicine (minor alkaloids) and vasicine isolated from leaves; percentage of minor alkaloids and total alkaloids showed seasonal variation; samples collected in Mar.-Apr. showed a higher percentage of minor alkaloids, whereas those collected in June-Sept. had higher content of vasicine (*Indian Drugs* 1990, *27*, 328); two new aliphatic hydroxyketones isolated from aerial parts and characterised as 37-hydroxyhexatetracont-1-en-15-one and 37-hydroxyhentetracontan-19-one (*Phytochemistry* 1991, *30*, 3799); 29-methyltriacontan-1-ol along with β-sitosterol isolated from aerial parts (*Fitoterapia* 1992, *63*, 262).

ADIANTUM (Adiantaceae)

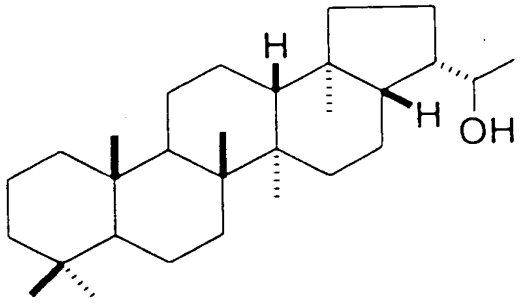
A. capillus-veneris L. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 13).

Isolation of β-sitosterol, stigmasterol and campesterol from leaves (*Boll. Soc. Ital. Biol. Sper.* 1989, *65*, 461; *Chem. Abstr.* 1990, *112*, 73892 h).

A. caudatum L. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 13).

A new triterpene alcohol - 29-norhopan-22-ol - isolated and its structure elucidated; β-sitosterol, its glucoside, quercetin-3-O-glucoside, filic-3-ene and adiantone also isolated (*J. Indian Chem. Soc.* 1990, *67*, 86).

NEW COMPOUNDS



29-Norhopan-22-ol

A. pedatum L. (*Compend. Indian Med. Plants*, Vol. 1, Rastogi & Mehrotra, PID, New Delhi, 1990, p. 11).

Isolation and structure elucidation of three new triterpenoids - 23-hydroxyfernene,

Oil showed good activity *in vitro* against *Bacillus subtills, Diplococcus pneumoniae, Shigella flexneri, Vibrio cholerae, Ascaris lumbricoides* and *Taenia solium* (*Indian Perfum.* 1993, *37,* 318; *Chem. Abstr.* 1994, *121,* 42530 v).

Ayapanin, ayapin, thymoquinol dimethyl ether, thymoquinone and methyl thymyl ether isolated from aerial parts of plant collected in Daiyen Hanoi (*Planta Med.* 1993, *59,* 99); ayapin synthesised (*Indian J. Chem.* 1993, *32*B, 372); determination of thymohydroquinine dimethyl ether (50.36%) in flower oil (*Indian Perfum.* 1993, *37,* 318; *Chem. Abstr.* 1994, *121,* 42530 v).

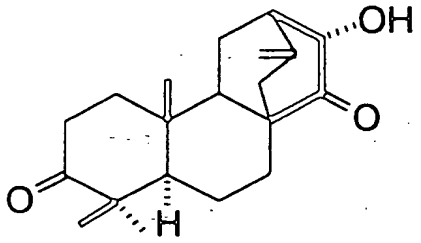
EUPHORBIA (Euphorbiaceae)

E. acaulis Roxb.; see *E. fusiformis* Buch.- Ham. ex D.Don

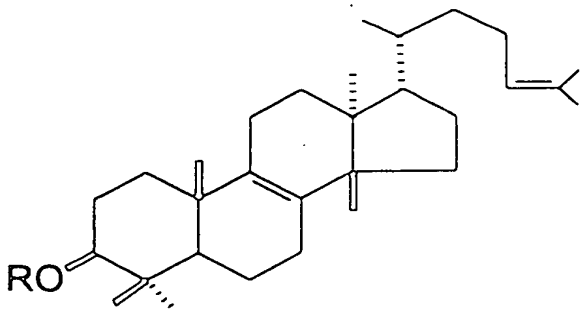
E. antiquorum L. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 307).

Isolation and structure determination of 3,12-di-O-acetyl-8-O-benzoylingol, 3,12-di-O-acetyl-8-O-tigloylingol, 12-O-acetyl-8-O-tigloylingol and 8-O-tigloylingol (*Chem. Pharm. Bull.* 1989, *37,* 1547); structure of antiquorin revised by X-ray diffraction which showed trans-fused A and B rings (*Phytochemistry* 1990, *29,* 3952); three new triterpenes - euphol-3-O-cinnamate, antiquols A and B - isolated from latex and their structures established; euphol, 24-methylenecycloartanol, cycloeucalenol, (Z)9-nonacosene, sitosterol and p-acetoxyphenol also isolated (*Phytochemistry* 1990, *29,* 1625).

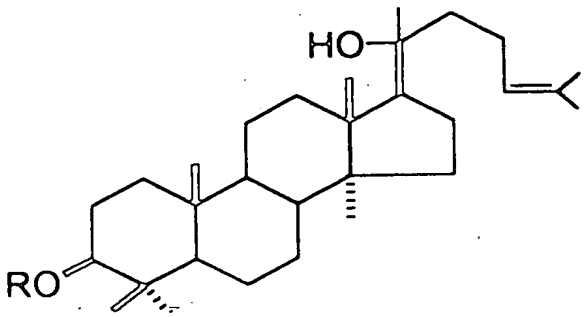
NEW COMPOUNDS



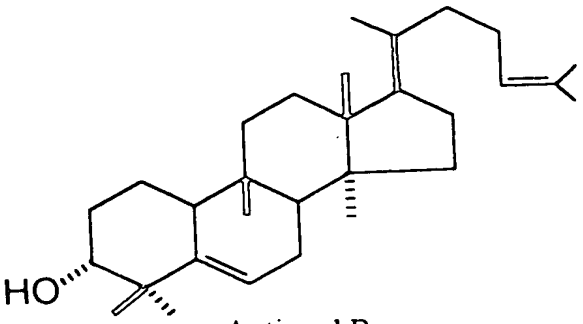
Antiquorin



Euphol 3-O-cinnamate
R = Cinnamoyl



Antiquol A
R = Cinnamoyl



Antiquol B

ACKNOWLEDGEMENTS

The editor would like to take this opportunity to express his gratitude to the Director General, Council of Scientific and Industrial Research, New Delhi, for sanctioning the project under which this Compendium series was undertaken. The first, second, third and fourth volumes of this series which were published in 1990, 1991, 1993 and 1995 respectively were well received; first and second volumes were reprinted in 1993 and subsequent volume 4 has also been reprinted. I am thankful to Dr. V.P. Kamboj, the former Director and Dr. C.M. Gupta the present Director of the Central Drug Research Institute, Lucknow, for providing financial assistance and all the infrastructural facilities for the completion of the present volume.

Thanks are due to Dr. S. Bhattarcharji, former Dy. Director, CDRI, Lucknow, for his invaluable help in correction of the manuscript and to Dr. O.N. Tripathi, the Scientist-incharge of the Library for his whole-hearted cooperation in providing the Library facilities. I also thank the staff members, Mr. R.C. Dwivedi and Mr. D.N. Vishwakarma for typing the manuscript and generally assisting in making it ready for the press; Mr. Dwivedi has also done the computer processing of the indexes.

I would particularly like to acknowledge the personal interest and support of Dr. C.M. Gupta and Dr. V.P. Kamboj, towards the publication of these volumes. I am thankful to the Authorities of National Institute of Science Communication (NISCOM), CSIR, New Delhi, for expeditious publication of these volumes.

RAM P. RASTOGI

BIOLOGICAL ACTIVITY

Euphol (i.v.) showed dose-dependent hypotensive activity ranging from slight to marked, in normotensive anaesthetised dogs and rats. It inhibited various autonomic pressor and depressor responses. Hypotensive effect was not affected in dogs by pretreatment with atropine, antistine or β-blockers. Its LD50 was 1.5 g/kg, i.p. and 2.0 g/kg by oral route in mice (*Planta Med.* 1989, *55*, 498).

E. cattimandoo W. Elliot syn. *E. trigona* sensu Hook.f., p.p. (non Haw.)

Isolation of taraxerone, taraxeryl acetate, taraxerol, ψ-taraxasterol, friedelan-3β-yl acetate, friedelan-3β-ol, friedelan-3α-ol, glut-5-en-3β-ol, cycloartenol and β-sitosterol from stems (*Acta Cienc. Indica, Chem.* 1988, *14*, 115; *Chem. Abstr.* 1990, *112*, 52229 g).

Distribution: Peninsular India and Andaman Islands.

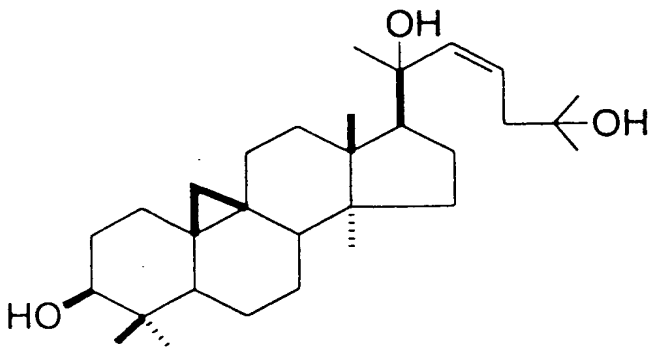
E. clarkeana Hook.f.

H. - Dudhi, Dudhni.

A new triterpene - cycloclarkeanol - isolated and its structure established; cycloartanol, cycloart-23-en-3β,25-diol and 20-acetylingenol-3-decadienoate also isolated (*J. Nat. Prod.* 1992, *55*, 959).

Distribution: Himalayas, Kashmir and Himachal Pradesh, ascending to 2000 m and plains of northern India.

NEW COMPOUNDS



Cycloclarkeanol

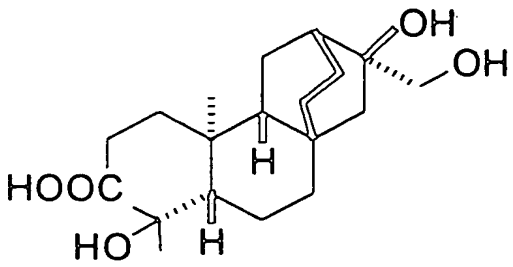
E. dracunculoides Lamk. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 308).

Nasutin B, esculetin, (–)anabellamide, acacetin and β-sitosterol-β-D-glucoside isolated from whole plant (*Indian J. Chem.* 1992, *31*B, 133); isolation and structure elucidation of kaempferol-3-O-glucuronic acid methyl ester and kaempferol-3-O-β-glucosyl(1→4)-β-glucuronic acid methyl ester along with kaempferol (*Mansoura J. Pharm. Sci.* 1993, *9*, 204; *Chem. Abstr.* 1994, *121*, 78268 e).

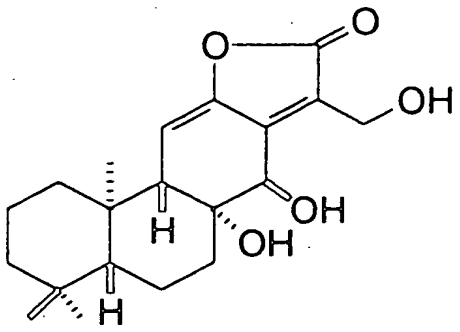
E. fusiformis Buch.-Ham. ex D.Don syn. *E. acaulis* Roxb. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 308).

Isolation of a new ent-seco-atisane diterpene - ent-3,4-seco-4,16α,17-trihydroxyatisan-3-oic acid (I) - from rhizomes and its crystal structure determination (*J. Nat. Prod.* 1990, *53,* 470); a highly oxygenated ent-abietane diterpene isolated and characterised as (4R,4aR)-4,4a-dihydroxy-3-hydroxymethyl-7,7,10a-trimethyl-2,4,4a,5,6,6a,7,8,9,10,10a,10b-dodecahydrophenanthro[3,2-b]furan-2-one (II) (*Phytochemistry* 1994, *35,* 1061).

NEW COMPOUNDS



I

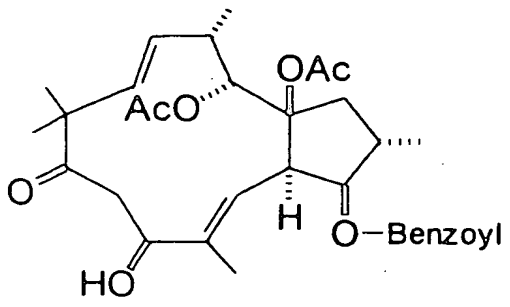


II

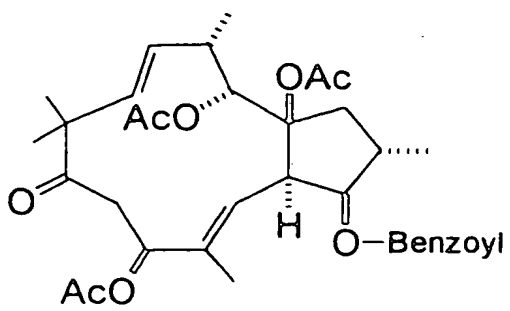
E. helioscopia L. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 310).

Isolation and structure elucidation of twelve euphoscopins A-L; four epieuphoscopins A, B, D and F; eleven euphornins A-K; two euphohelioscopins A and B; euphornin and euphohelionone from leaves and roots; crystal structure of euphoscopin A and euphornin also determined (*Phytochemistry* 1989, *28,* 3421); four new hydrolysable tannins - helioscopinins A and B and helioscopins A and B - isolated and their structures established (*Chem. Pharm. Bull.* 1990, *38,* 1518); isolation of two new tannins - euphorscopin and euphorhelin - along with geraniin, corilagin and helioscopinin A, and structure determination of new compounds (*Chem. Pharm. Bull.* 1991, *39,* 630).

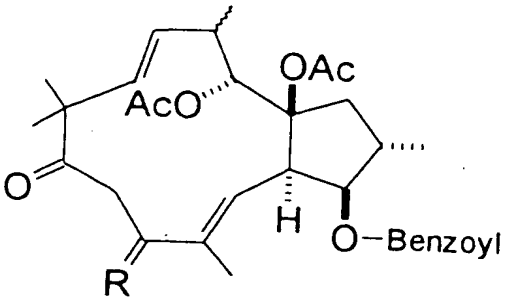
NEW COMPOUNDS



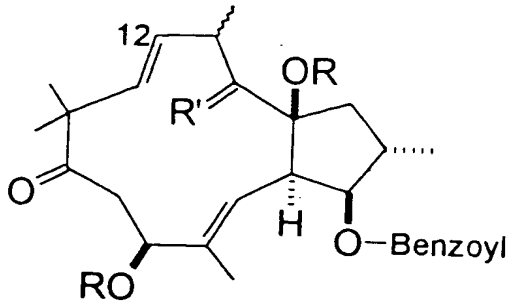
Euphoscopin A



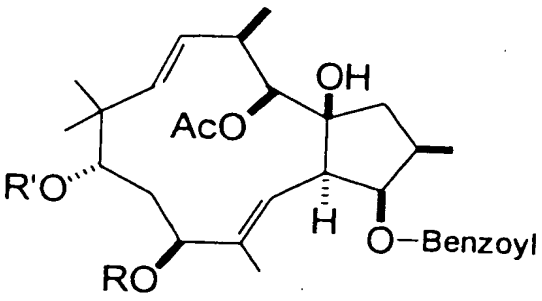
Euphoscopin B



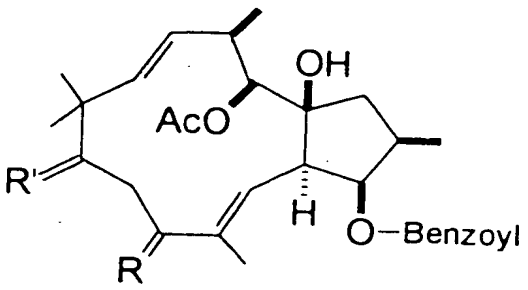
Euphoscopin C
R = α-H,β-OBenzoyl, ~ = α
Euphoscopin D
R = O, ~ = α
Epieuphoscopin A
R = α-H,β-OH, ~ = β
Epieuphoscopin B
R = α-H,β-OAc, ~ = β
Epieuphoscopin D
R = O, ~ = β



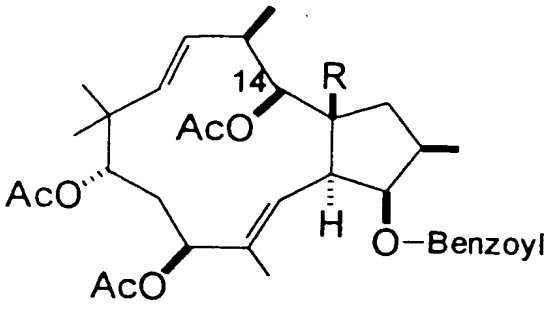
Euphoscopin E
R = H, R' = O, R" = Ac, ~ = α
Euphoscopin F
R = Ac, R' = O, R" = Ac, ~ = α
Epieuphoscopin F
R = Ac, R' = O, R" = Ac, ~ = β
Euphoscopin G
R,R" = H, R' = α-OAc,β-H, ~ = α
Euphoscopin H
R = Ac, R' = α-OAc,β-H, R" = H, ~ = α
Euphoscopin I
R = H, R' = α-OH,β-H, R" = Ac, ~ = α
Euphoscopin J
R = Ac, R' = α-OH,β-H, R"= Ac, ~ = α
Euphoscopin K
R = Ac, R' = α-OH,β-H, R" = H, ~ = α
Euphoscopin L
R = H, R' = O, R" = Ac, ~ = α, Δ^{12} isomer



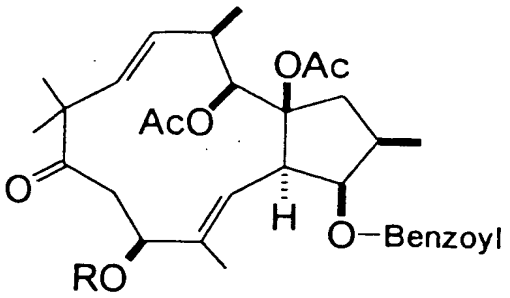
Euphornin
R,R' = Ac
Euphornin A
R = H, R' = Ac
Euphornin B
R = Ac, R' = H



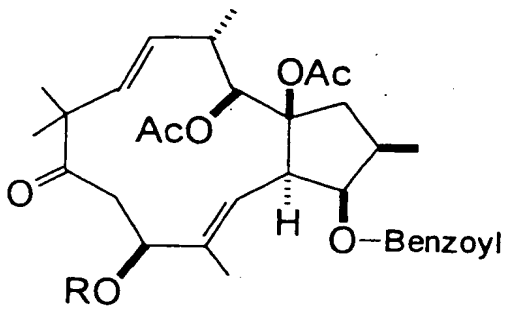
Euphornin C
R = O, R' = α-OAc,β-H
Euphornin F
R = β-OH,α-H, R' = O
Euphornin G
R = β-OAc,α-H, R' = O



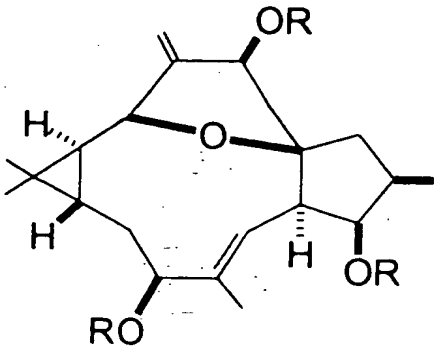
Euphornin D
R = OAc
Euphornin E
R = H, Δ^{14} isomer



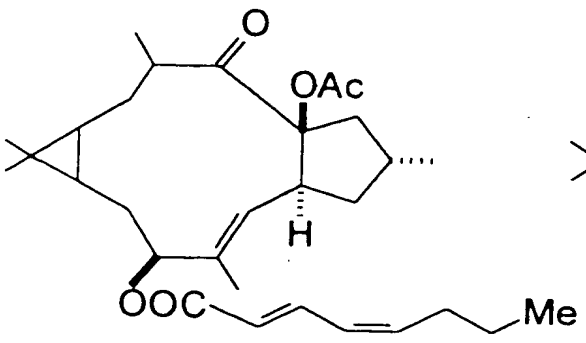
Euphornin H
R = Ac
Euphornin I
R = H



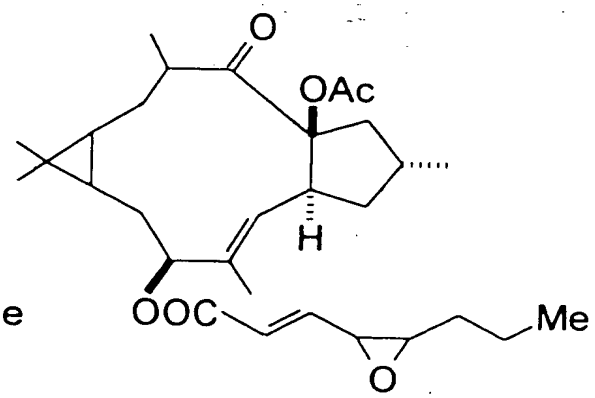
Euphornin J
R = Ac
Euphornin K
R = H



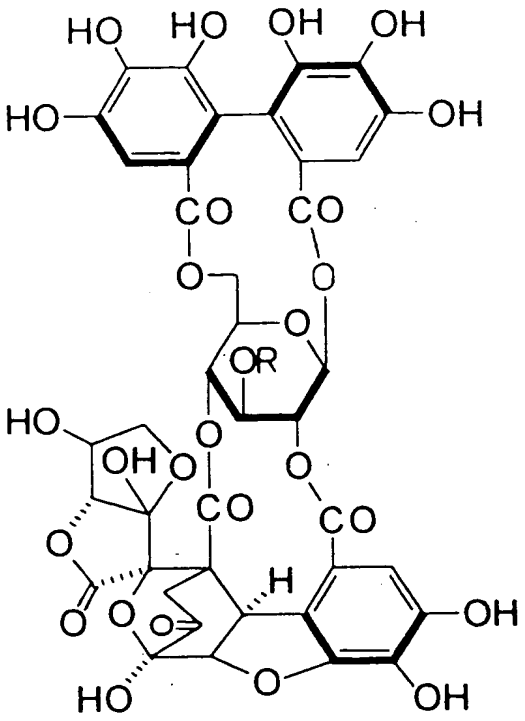
Euphohelionone
R = Benzoyl



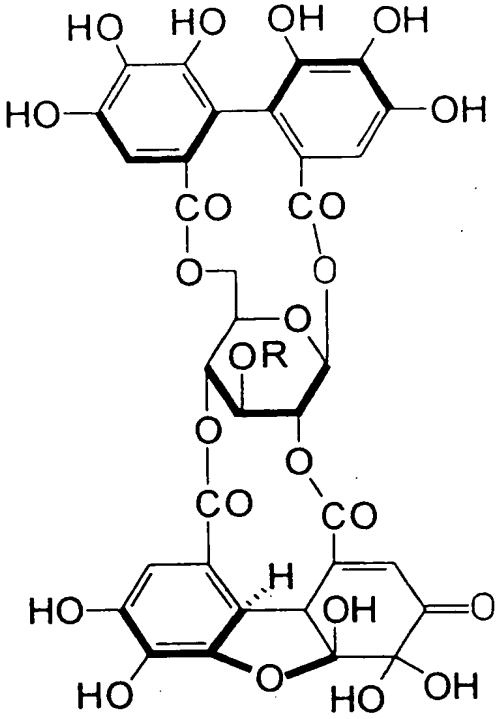
Euphohelioscopin A



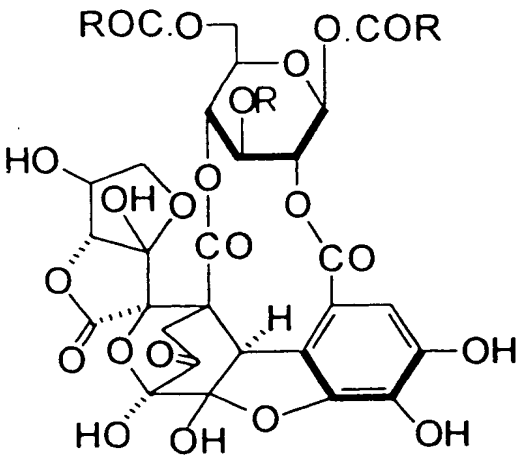
Euphohelioscopin B



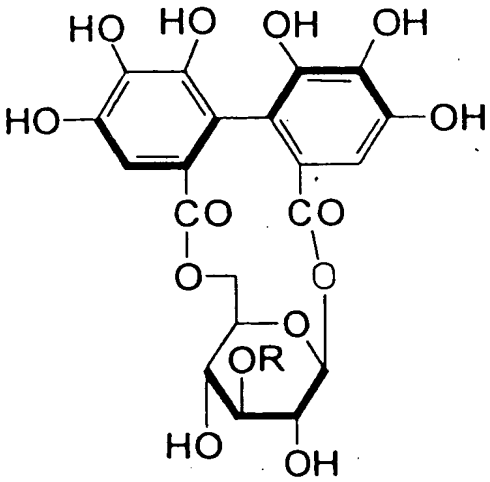
Helioscopin A
R = Galloyl



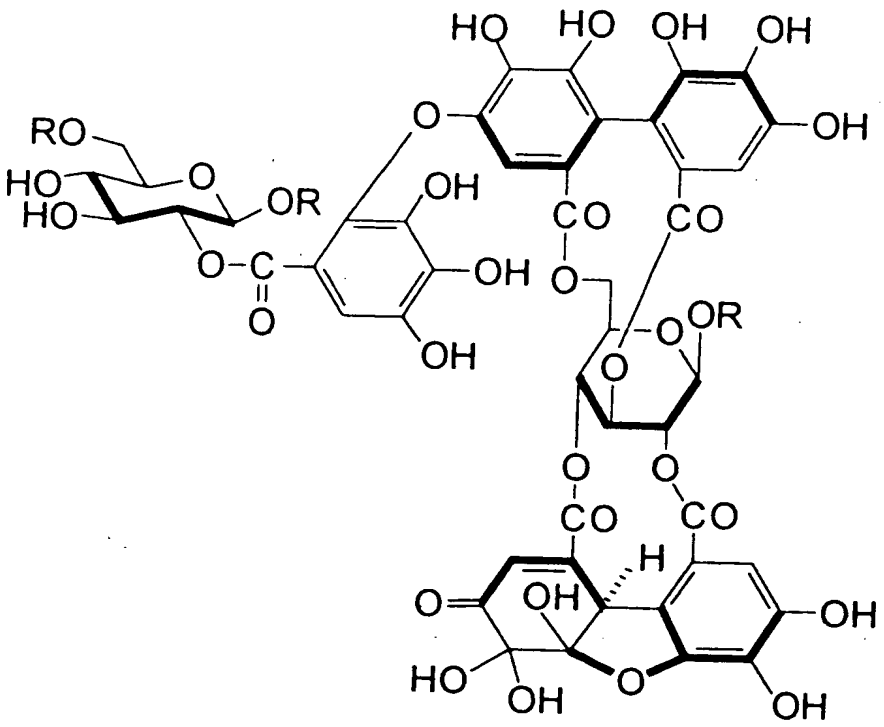
Helioscopinin A
R = Galloyl



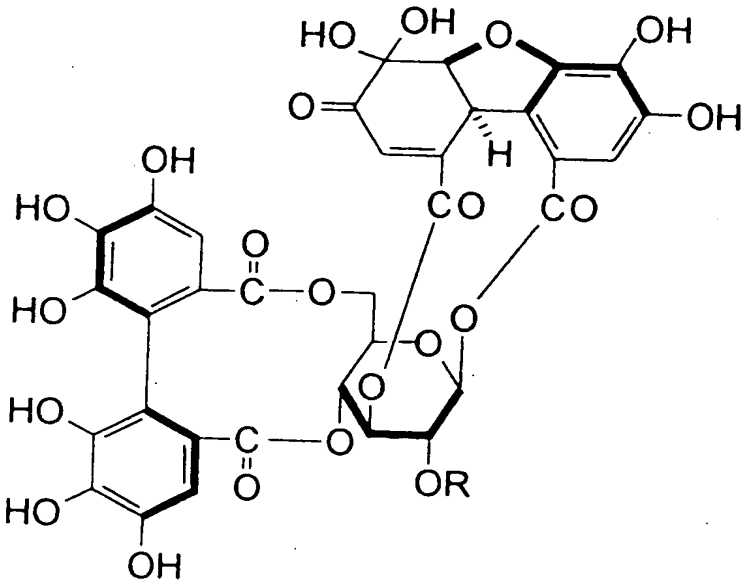
Helioscopin B
R = Galloyl



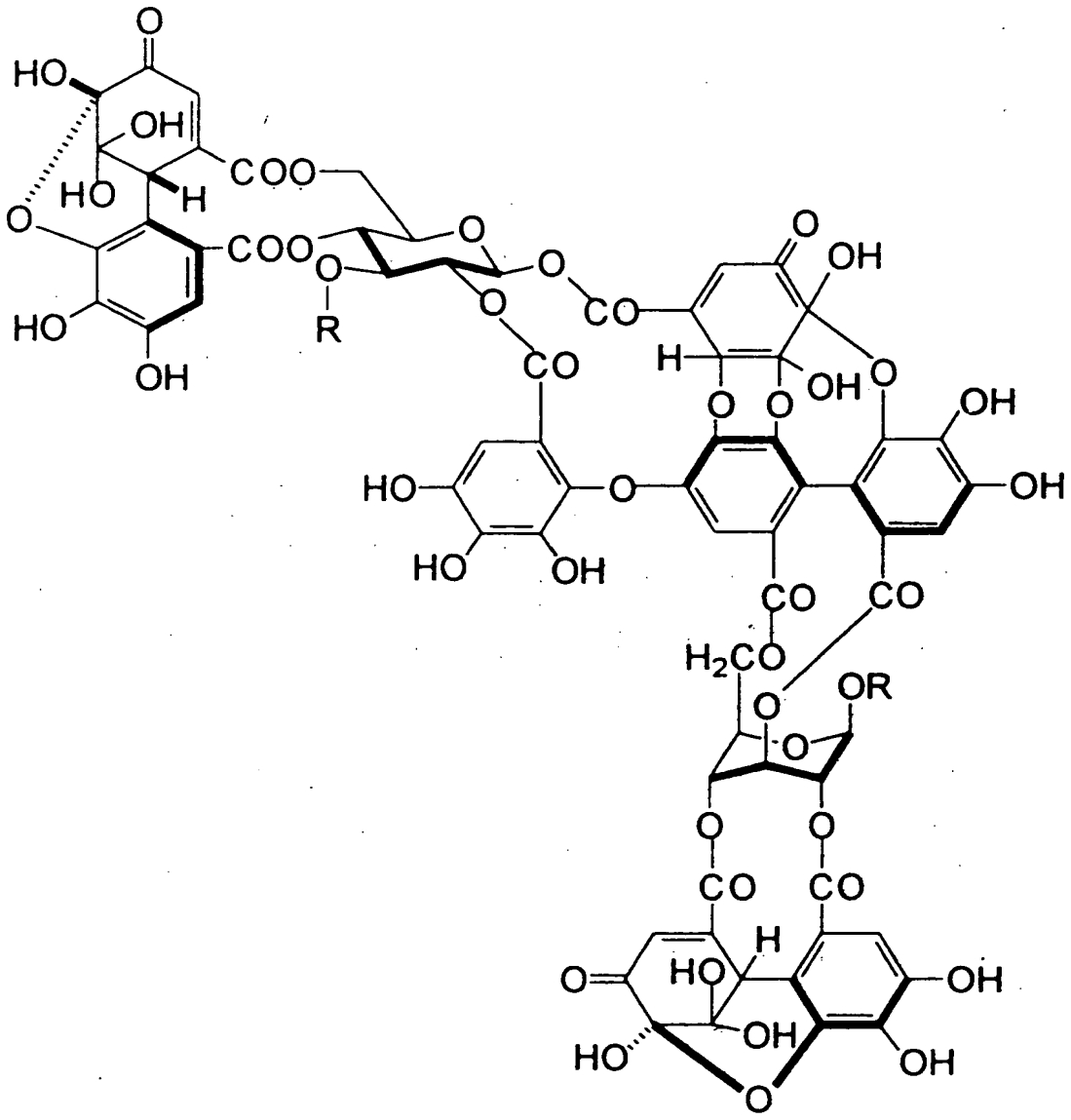
Helioscopinin B
R = Galloyl



Euphorhelin
R = Galloyl



Euphorscopin
R = Galloyl



Euphorbin E
R = Galloyl

BIOLOGICAL ACTIVITY

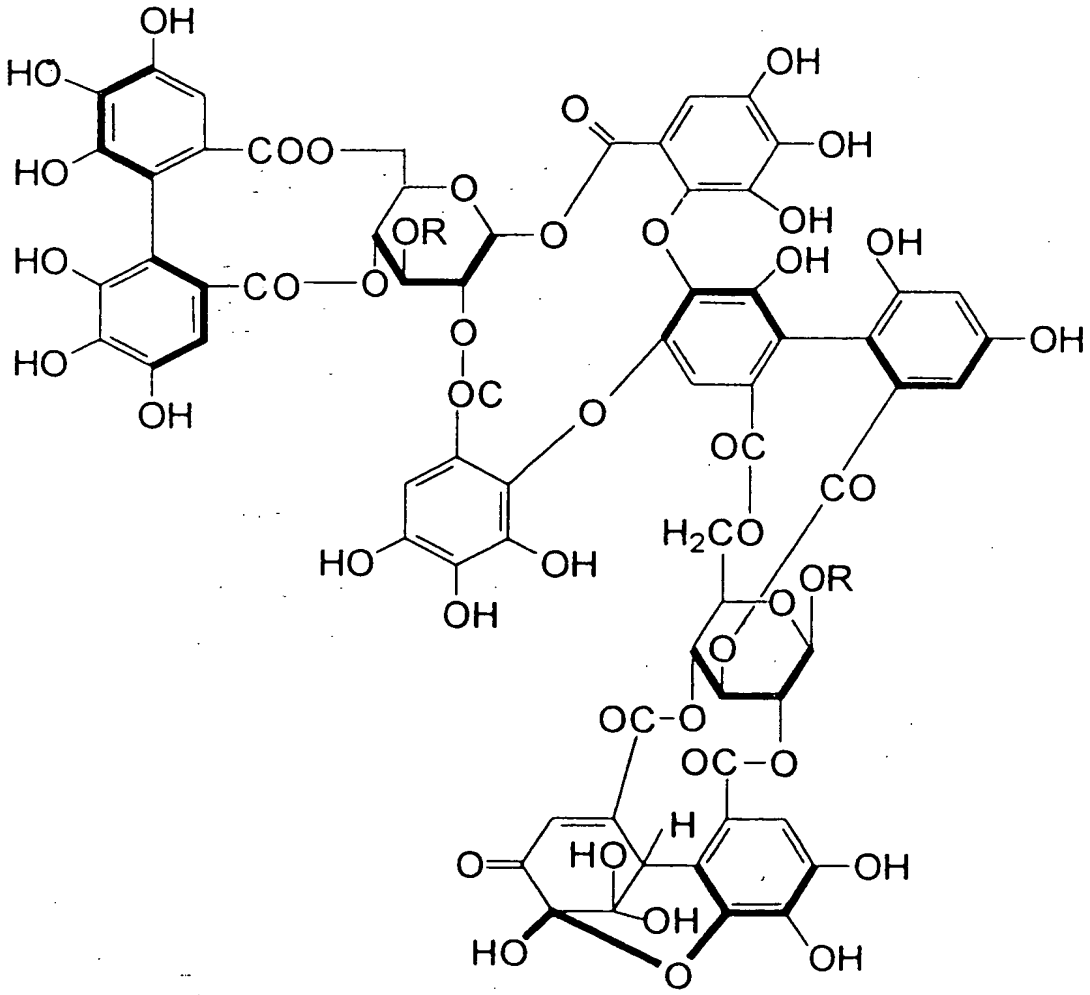
Quercitrin (50.0 mg/kg) showed antidiarrhoeic activity against castor oil and PGE2-induced diarrhoea in mice. It also delayed rat small intestinal transit when this was accelerated with castor oil. However, when administered intraluminally it did not modify fluid transport

E. hirta L. syn. *E. pilulifera* auct. (non L.) (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 310).

Plant extract exhibited antidiarrhoeal activity in experimental models of diarrhoea induced by castor oil, arachidonic acid and prostaglandin E2, but not in model of magnesium sulphate-provoked diarrhoea. It delayed transit in small intestine when this was accelerated by castor oil but not in normal condition (*Planta Med.* 1993, *59*, 333).

Three new dimeric hydrolyzable tannins - euphorbins C, D and E - isolated and their structures determined (*Tennen Yuki Kagobutsu Toronkai Koen Yoshishu* 1989, 31st, 601; *Chem. Abstr.* 1990, *113*, 74720 h; *Chem. Pharm. Bull.* 1990, *38*, 86, 1113); isolation of gallic acid, quercetin, myricitrin, 3,4-di-O-galloylquinic acid, 2,4,6-tri-O-galloyl-β-D-glucose and 1,2,3,4,6-penta-O-galloyl-β-D-glucose from leaves (*Zhongguo Zhongyao Zazhi* 1991, *16*, 38; *Chem. Abstr.* 1991, *114*, 203549 f).

NEW COMPOUNDS



Euphorbin C
R = Galloyl

across colonic mucosa either in normal condition or when this transport was altered by PGE2 or sodium picosulphate. Quercetin increased colonic fluid absorption only in presence of secretagogue compounds such as PGE2 and sodium picosulphate (*J. Pharm. Pharmacol.* 1993, *45*, 157; *Planta Med.* 1993, *59*, 333); ingenol triacetate was potent inducer of nerve growth factor production in L-M cells (*Biosci., Biotechnol., Biochem.* 1994, *58*, 1749; *Chem. Abstr.* 1994, *121*, 246113 w).

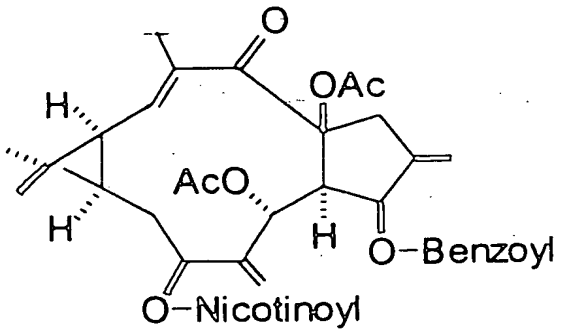
E. laeta Heyne ex Roth syn. *E. rothiana* Spreng. (*Glossary Indian Med. Plants*, Chopra, Nayar & Chopra, PID, New Delhi, 1956, p. 114).

Hentriacontane, friedelin and 3,3'-di-O-methylellagic acid-4'-O-β-D-xyloside isolated (*Fitoterapia* 1990, *61*, 379)

E. lathyrus L. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 311).

Isolation of a new 7-hydroxylathyrol ester - L9 - from seeds along with L1, L3 and L8 and its structure determination; relative configuration of L9 also determined (*Phytochemistry* 1990, *29*, 2025); seeds afforded ingenol (*Z. Naturforsch.* 1991, *46*B, 1425; *Chem. Abstr.* 1992, *116*, 21275 x); guimarenol, 24-methyllanosterol, taraxerone, hopenol B, hopenone I, hopenone II, hopenone B, 3-oxo-2-hydroxyhopane, simiarenone, fernenone, cholesterol, campesterol, stigmasterol, sitosterol and isofucosterol from seedlings (*Plant Sci.* 1991, *74*, 185; *Chem. Abstr.* 1991, *115*, 46048 t); determination of esculetin (0.3013, 0.2094 and 0.2046%) in seeds from three different areas of China (*Zhongguo Zhongyao Zazhi* 1993, *18*, 458; *Chem. Abstr.* 1994, *120*, 62392 j).

NEW COMPOUNDS



L9

E. neriifolia L. (*Compend. Indian Med. Plants*, Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 285).

A new diterpene - neriifolene - isolated along with antiquorin and its structure established (*Phytochemistry* 1990, *29*, 662); molecular structure of neriifolene determined by X-ray studies (*Acta Crystallogr., Cryst. Struct. Commun.* 1992, *48*C, 753; *Chem. Abstr.* 1992, *117*, 8235 k); isolation of two glycosides - 3,4,3'-tri-O-methylellagic acid-4'-rutinoside and 3,4-di-O-

HEVEA (Euphorbiaceae)

H. brasiliensis (H.B. & K.) Muell.-Arg. (*Compend. Indian Med. Plants,* Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 342).

Freshly-tapped latex contained deoxyribonuclease (*Proc. Malays. Biochem. Soc. Conf.* 1989, 14th, 12; *Chem. Abstr.* 1990, *113,* 112455 k).

HEYNEA (Meliaceae)

H. trijuga Roxb. ex Sims.; see *Trichilia connaroides* (Wt. & Arn.) Bentvelzen

HIBISCUS (Malvaceae)

H. abelmoschus L.; see *Abelmoschus moschatus* Medik.

H. cannabinus L. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 381).

Purified pectic acid isolated from unretted mesta fibres contained backbone of (1→4)-linked galacturonic acid residues (78.0), arabinose (3.6), rhamnose (3.0) and galactose (1.2%) (*Indian J. Chem.* 1990, *29*B, 188).

H. mutabilis L. (*Compend. Indian Med. Plants,* Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 343).

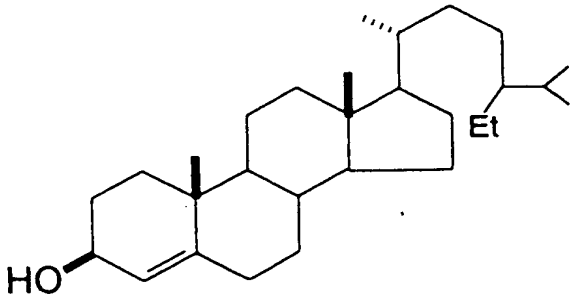
Flowers afforded nonacosane, β-sitosterol, betulinic acid, hexyl stearate, stigmasta-3,7-dione, stigmast-4-en-3-one, tetratriacontanol, quercetin and kaempferol (*Zhongcaoyao* 1993, *24,* 227; *Chem. Abstr.* 1993, *119,* 113385 y).

H. rosa-sinensis L. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 381).

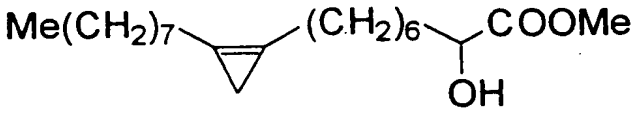
Isolation and structure elucidation of β-rosasterol from Chinese plant (*Zhongcaoyao* 1991, *22,* 3; *Chem. Abstr.* 1991, *114,* 244254 z); methyl (R)2-hydroxysterculate isolated from root bark along with methyl sterculate and methy malvalate and characterised (*Chem. Lett.* 1991, 47; *Chem. Abstr.* 1991, *114,* 160744 w; *Bull. Chem. Soc. Jpn.* 1991, *64,* 3084); two cyclopeptide alkaloids (I and II) isolated from flowers of Pakistani plant and their structures proposed (*Sci. Ind.* 1992, *4,* 147; *Chem. Abstr.* 1993, *118,* 230140 e); hibiscus mucilage RL contains an acidic polysaccharide composed of rhamnose, galactose, galacturonic acid and glucuronic acid in molar ratio of 5.0:8.0:3.0:2.0 respectively (*Biol. Pharm. Bull.* 1993, *16,* 735; *Chem. Abstr.* 1994, *120,* 212550 a); two aliphatic enone ethers isolated from roots and characterised as methyl (E)11-methoxy-9-oxo-10-nonadecenoate and (E)10-methoxy-8-oxo-9-octadecenoate; in addition,

methyl sterculate, methyl malvalate and methyl (R)2-hydroxysterculate isolated (*Phytochemistry* 1994, *35*, 1245).

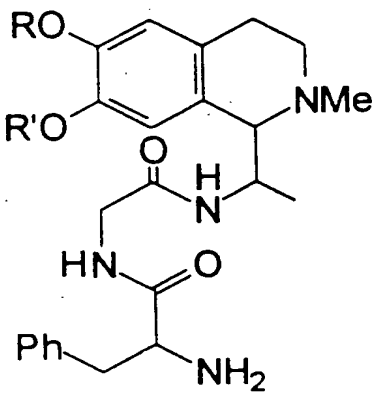
NEW COMPOUNDS



β-Rosasterol



Methyl (R)2-hydroxysterculate



I

R = H, R' = Me

II

R = Me, R' = H

BIOLOGICAL ACTIVITY

Hibiscus mucilage RL showed considerable anticomplementary activity (*Biol. Pharm. Bull.* 1993, *16*, 735; *Chem. Abstr.* 1994, *120*, 212550 a).

H. sabdariffa L. (*Compend. Indian Med. Plants*, Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 343).

Alcoholic extract of flowers inhibited *in vitro* angiotensin I-converting enzyme and to lesser degree elastase, trypsin and α-chymotrypsin; *in vivo* angioprotective effects in rats were apparently due to presence of flavones and anthocyanins (*J. Pharm. Belg.* 1990, *45*, 120; *Chem. Abstr.* 1990, *113*, 70966 v).

A pigment isolated from calyxes and its structure established as delphinidin-3-O-β-D-xylopyranosyl(1→2)-β-D-glucopyranoside (*Shokuhin Eiseigaku Zasshi* 1991, *32*, 301; *Chem.*

Abstr. 1992, *116*, 80491 n); determination of linoleic (43.2), oleic (24.7), palmitic (17.2), sterculic (2.1), linolenic (1.2%) and myristic, palmitoleic, epoxyoleic, stearic, malvalic, dihydrosterculic and eicosenoic acids (<1.0% each) in seed oil by GC-MS (*J. Agric. Food Chem.* 1992, *40*, 1186; *Chem. Abstr.* 1992, *117*, 46818 k); sepals contained delphinidin-3-O-sambubioside, cyanidin-3-O-glucopyranoside, quercetin, myricetin, hibiscetin, hibiscitrin and o-coumaric and p-coumaric acids (*Rastit. Resur.* 1993, *29*, 31; *Chem. Abstr.* 1994, *120*, 4596 t).

H. syriacus L. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 382).

Taxifolin-3-O-β-D-glucopyranoside, herbacetin-7β-D-glucopyranoside and kaempferol-3α-L-arabinosido-7α-L-rhamnopyranoside isolated from petals whereas leaves afforded saponaretin and saponarin (*Khim. Prir. Soedin.* 1990, 552; *Chem. Abstr.* 1991, *114*, 139773 v); bark contained azelaic acid, suberic acid, 1-octacosanol, β-sitosterol, docosanediol, betulin and erythrotriol (*Zhongguo Zhongyao Zazhi* 1993, *18*, 37; *Chem. Abstr.* 1993, *118*, 187847 b).

HIPPOCRATIA (Hippocrateaceae)

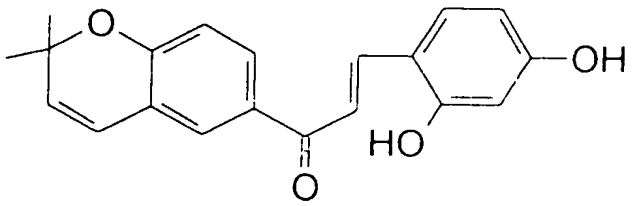
H. grahamii Wt.; see *Reissantia grahamii* (Wt.) Ding Hou

H. indica Willd.; see *Reissantia indica* (Willd.) Halle

HIPPOPHAE (Elaegnaceae)

H. rhamnoides L. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 382).

Total flavones inhibited contraction of isolated rabbit aortic preparation induced by KCl, $CaCl_2$ and noradrenaline. It also reduced Ca^{2+}-dependent contraction in aortic preparation (*Xi'an Yike Daxue Xuebao* 1990, *11*, 332; *Chem. Abstr.* 1991, *115*, 21960 w); total flavones inhibited oscillatory after-potentials and decreased rate of spontaneous electrical activity induced by ouabain, shortened action potential duration of 50% repolarisation and reduced contractile force in guinea pig papillary muscles, thereby indicating that they possess antiarrhythmic activity (*Xi'an Yike Daxue Xuebao* 1992, *13*, 343; *Chem. Abstr.* 1993, *118*, 116456 n); seed oil markedly protected against liver damage induced by CCl_4, acetaminophen and EtOH. Seed oil (4.75 g/kg) also lowered SGPT levels and blocked depletion of GSH in damaged liver (*Zhonghua Yufang Yixue Zazhi* 1992, *26*, 227; *Chem. Abstr.* 1993, *118*, 94288 e); cardiac performance and haemodynamics of normal human subjects observed after oral administration of total flavones; strengthening of myocardial contractility and pump function of heart, reduction of total peripheral vascular resistance and increase in vascular elasticity were observed (*Xi'an Yike Daxue Xuebao* 1993, *14*, 138; *Chem. Abstr.* 1993, *119*, 151873 p).



Munsericin

BIOLOGICAL ACTIVITY

(−)13α-Hydroxydeguelin, (−)13α-hydroxytephrosin, munsericin, deguelin, tephrosin and 4-hydroxylonchocarpin strongly inhibited phorbol ester-induced ornithine decarboxylase activity in cultured mouse 308 epidermal cells (*Phytochemistry* 1994, *36*, 1523).

M. suberosa Benth.; see *M. sericea* (Willd.) A. Cheval

MUNTINGIA (Elaeocarpaceae)

M. calabura L. (*Compend. Indian Med. Plants*, Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 439).

Kaempferol, quercetin and their 3-O-galactosides, caffeic and ellagic acids identified in fresh leaves and flowers (*Fitoterapia* 1990, *61*, 374); chrysin, 2',4'-dihydroxychalcone, galangin 3,7-dimethyl ether, 5,7-dihydroxy-8-methoxyflavonol, tiliroside and buddlenoid A isolated from leaves and stems (*Int. J. Pharmacog.* 1993, *31*, 77; *Chem. Abstr.* 1993, *119*, 124958 p).

BIOLOGICAL ACTIVITY

Chrysin, 2',4'-dihydroxychalcone and galangin 3,7-dimethyl ether exhibited activity against a panel of human and murine cell lines (*Int. J. Pharmacog.* 1993, *31*, 77; *Chem. Abstr.* 1993, *119*, 124958 p).

MURRAYA (Rutaceae)

M. exotica L.; see *M. paniculata* (L.) Jack

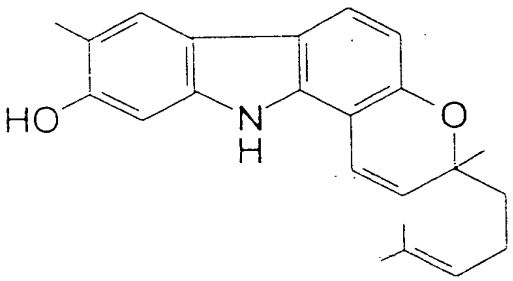
M. koenigii (L.) Spreng. (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 486).

Stem bark extract (1.0 g/kg) reduced carragenin-induced inflammation (~65.25%) in rats (*Proc. Natl. Acad. Sci. India* 1992, *62*A, 5; *Chem. Abstr.* 1994, *121*, 91440 z).

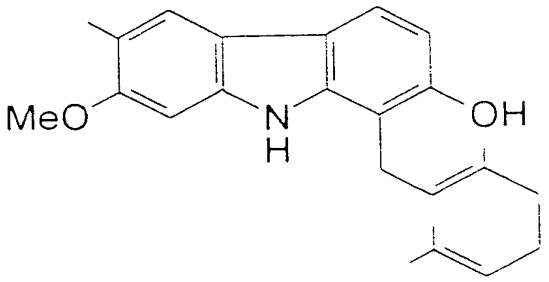
Isolation of a carbazole alkaloid - murrayazolinol - from stem bark and its structure determination (*J. Indian Chem. Soc.* 1989, *66*, 140); total synthesis of mukonine, murrayanine and koenoline (*Chem. Commun.* 1990, 664); total seed lipids (4.4%) contained neutral lipids (85.4), glycolipids (5.1) and phospholipids (9.5%); neutral lipids consisted of triacylglycerols (73.9), free fatty acids (10.2%) and small amount of diacylglycerols, monoacylglycerols and sterols; glycolipids contained steryl glucoside and acylated steryl glucoside; the phospholipids

consisted of phosphatidylethanolamine, phosphatidylcholine, lysophosphatidylethanolamine and lysophosphatidylcholine (*J. Am. Oil Chemists Soc.* 1991, *68*, 651; *Chem. Abstr.* 1991, *115*, 228418 w); isolation of two new carbazole alkaloids - isomahanine and murrayanol - from fruits and their characterisation by X-ray analysis; in addition, mahanimbine, murrayazolidine, girinimbine, koenimbine and mahanine isolated (*Phytochemistry* 1992, *31*, 2877); a new coumarin - marmesin-1"-O-β-D-galactoside - along with osthol and umbelliferone isolated (*Proc. Natl. Acad. Sci. India* 1992, *62A*, 5; *Chem. Abstr.* 1994, *121*, 91440 z); three new monomeric carbazole alkaloids - mukoenines A, B and C - and five new monomeric carbazole alkaloids - murrastifoline F, bis-2-hydroxy-3-methylcarbazole, bismahanine, bikoeniquinone A and bismurrayaquinone A - isolated from roots and stems of plant grown in Shizuoka and their structures determined (*Chem. Pharm. Bull.* 1993, *41*, 2096); oil from leaves contained β-phellandrene (24.4), α-pinene (17.5), β-caryophyllene (7.3) and terpinen-4-ol (6.1%) (*J. Essent. Oil Res.* 1993, *5*, 371; *Chem. Abstr.* 1994, *121*, 153273 h); decahydrotetramethyl-cyclopropazulenol, selin-11-en-4α-ol and caryophyllene epoxide isolated from essential oil (*Fresenius J. Anal. Chem.* 1993, *347*, 286; *Chem. Abstr.* 1994, *120*, 330782 s); two carbazole alkaloids - girinimbilol and mahanimbilol - from stem bark and their characterisation (*Phytochemistry* 1994, *36*, 1073); two more new carbazole alkaloids isolated from stem bark and characterised as methyl 2-methoxycarbazole-3-carboxylate and 1-hydroxy-3-methylcarbazole (*Phytochemistry* 1994, *35*, 1085); 8-geranyloxypsoralen , imperatorin, heraclenin, isosaxalin, heraclenol, mahanimbine, girinimbine, koenimbin, isomahanine and mahanine isolated from seeds (*Planta Med.* 1994, *60*, 295).

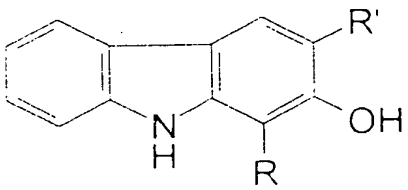
NEW COMPOUNDS



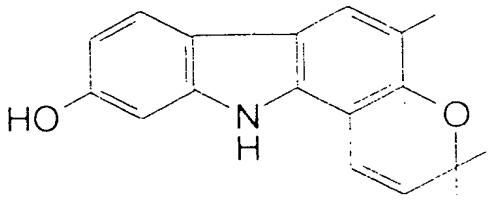
Isomahanine



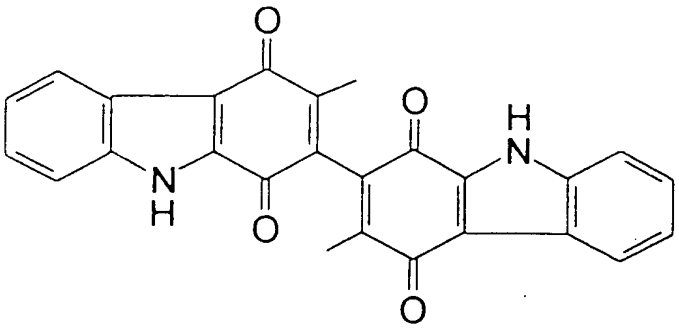
Murrayanol



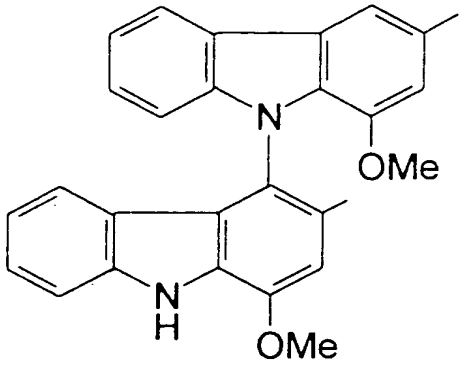
Mukoenine A
R = Prenyl, R' = Me
Mukoenine B
R = Geranyl, R' = CHO



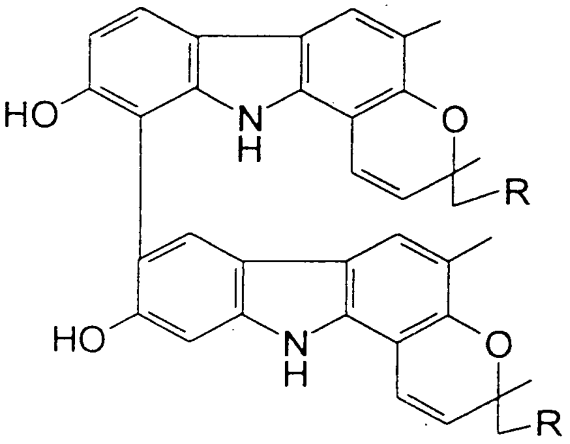
Mukoenine C



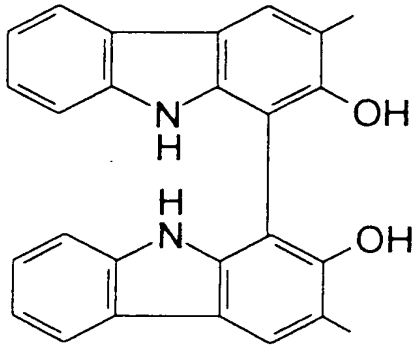
Bismurrayaquinone A



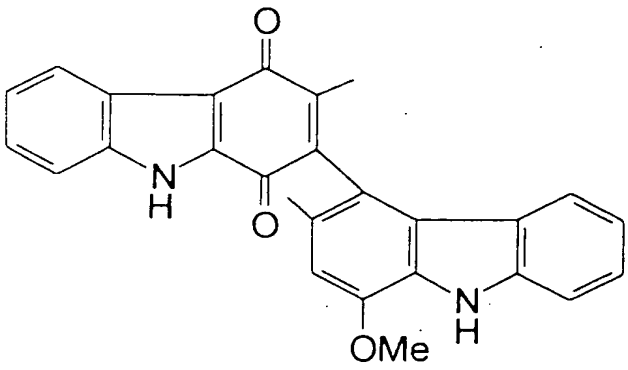
Murrastifoline F



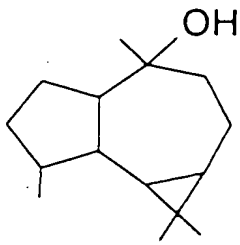
Bismahanine
R = Prenyl



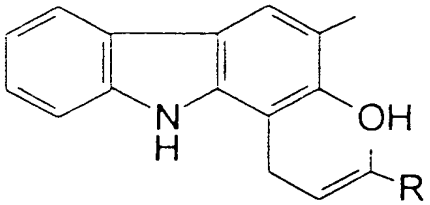
Bis-2-hydroxy-3-methylcarbazole



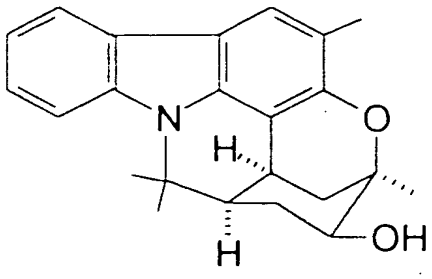
Bikoeniquinone A



Decahydrotetramethyl-cyclopropazulenol



Girinimbilol
R = Me
Mahanimbilol
R = $(CH_2)_2CH=CMe_2$



Murrayazolinol

BIOLOGICAL ACTIVITY

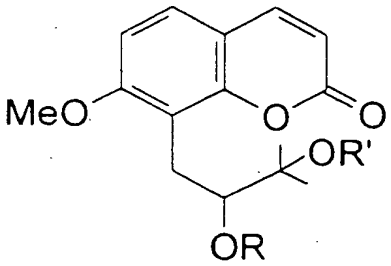
Marmesin-1"-O-β-D-galactoside showed moderate to appreciable activity against *Vibrio cholerae, Salmonella typhimurium, Klebsiella pneumoniae, Candida albicans, Aspergillus fumigatus and Trichophyton mentagrophytes* (*Proc. Natl. Acad. Sci. India* 1992, *62*A, 5; *Chem. Abstr.* 1994, *121*, 91440 z); yuehchukene exhibited anti-estrogenic effects in rat uterotrophic and mice vaginal smear assays and was found to bind to rat and mice estrogen receptors (*Eur. J. Pharmacol.* 1994, *264*, 1).

M. paniculata (L.) Jack syn. *M. exotica* L. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 487).

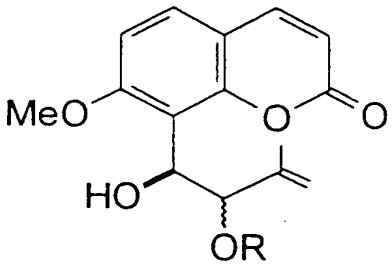
(+)Erythro-murrangatin, (−)minumicrolin, murralongin, murraxocin and a coumarin (I) isolated from leaves (*Bull. Pharm. Sci., Assiut Univ.* 1988, *11*, 88; *Chem. Abstr.* 1990, *112*, 69484 j); osthol, aurapten, lupeol, 3-epi-cyclolaudenol and cis-nerolidol isolated from leaves (*Bull. Pharm. Sci., Assiut Univ.* 1988, *11*, 105; *Chem. Abstr.* 1990, *112*, 30295 y); absolute configuration of natural paniculidines A and B established as R by synthesis of S-enantiomer (*J. Chem. Soc.* Perkin 1 1989, 1353; *Zh. Org. Khim.* 1990, *26*, 425; *Chem. Abstr.* 1990, *113*, 115628 e); isolation of murralongin from leaves and its ^{13}C-NMR (*J. Indian Chem. Soc.* 1990, *67*, 440); isolation and 2D-NMR of aurantiamide (*Indian J. Chem.* 1990, *29*B, 495); synthesis of paniculidine A and murrayacarine (*Bull. Soc. Chim. Fr.* 1990, 645; *Chem. Abstr.* 1991, *114*, 185795 b); structures of five new coumarins - murralonginol isovalerate, isomurralonginol isovalerate, murrangatin isovalerate, minumicrolin isovalerate and chloculol - and a new indole alkaloid - paniculol - determined; relative configuration of murrangatin as erythro and minumicrolin as threo revised to threo and erythro respectively; absolute configuration of (−)murrangatin shown to be (R,R) (*J. Chem. Soc.* Perkin 1 1990, 2047); another coumarin (II) isolated from leaves together with known coumarins and its structures established (*Rev. Latinoam. Quim.* 1991, *22*, 38; *Chem. Abstr.* 1992, *116*, 148161 n, 211110 n); synthesis of yuehchukene (*Tetrahedron Lett.* 1991, *32*, 1045; *Tetrahedron* 1992, *48*, 759); two new dimeric carbazole alkaloids - bis-7-hydroxygirinimbine A and bis-7-methoxygirinimbine A - isolated from plant cultivated in Egypt

and their structures determined (*Bull. Fac. Pharm.*, Cairo Univ. 1992, *30*, 231; *Chem. Abstr.* 1993, *119*, 177557 p); flowers afforded scopoletin (*Indian J. Chem.* 1992, *31*B, 133); murrayacanine, koenoline and koenimbine isolated from leaves (*Bull. Fac. Pharm.*, Cairo Univ. 1992, *30*, 235; *Chem. Abstr.* 1993, *119*, 156235 s); isolation of 5,6,7,8,3',4',5'-heptamethoxyflavone, 5,6,7,8,3',4'-hexamethoxyflavone, 5,6,8,3',4',5'-hexamethoxyflavone, 4-hydroxy-3,5,6,7,3',5'-hexamethoxyflavone, 3',5'-dihydroxy-3,6,7,4'-tetramethoxyflavone and 4,5-dihydroxy-3,6,7,3',5'-pentamethoxyflavone from root bark (*Bull. Fac. Pharm.*, Cairo Univ. 1992, *30*, 287; *Chem. Abstr.* 1993, *119*, 156240 q); isolation of murrayazolinol from root bark (*Indian Drugs* 1994, *31*, 32); three new coumarins - yuehgesins A, B and C - isolated from fresh flowers and characterised; in addition murracarpin, mupanidin, isomeranzin, murralongin, scopoletin, umbelliferone, paniculatin, broylin auraptenol, meranzin hydrate, minumicrolin, scopolin, caffeine, 4-hydroxybenzaldehyde, p-hydroxybenzoic acid, cis- and trans-ferulic acids, cis- and trans-methyl ferulate, trans-ethyl ferulate, 7-methoxy-8(1'-ethoxy-2'-hydroxy-3'-methyl-3'-butenyl)coumarin and 3,5,6,7,3',4',5'-heptamethoxyflavone also isolated (*J. Chin. Chem. Soc.* 1994, *41*, 213; *Chem. Abstr.* 1994, *121*, 5109 u).

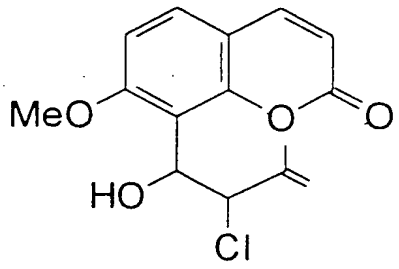
NEW COMPOUNDS



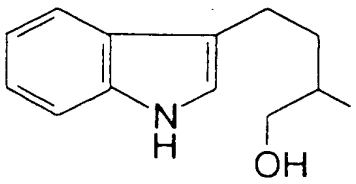
I
R = H, R' = Et
II
R = Et, R' = H



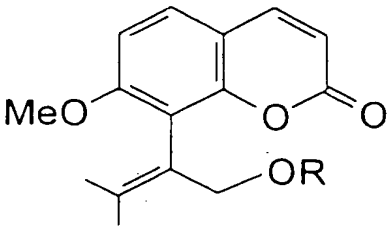
Murrangatin
R = H, ~ = β
Minumicrolin isovalerate
R = Isovaleryl, ~ = α



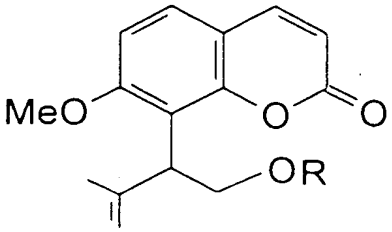
Chloculol



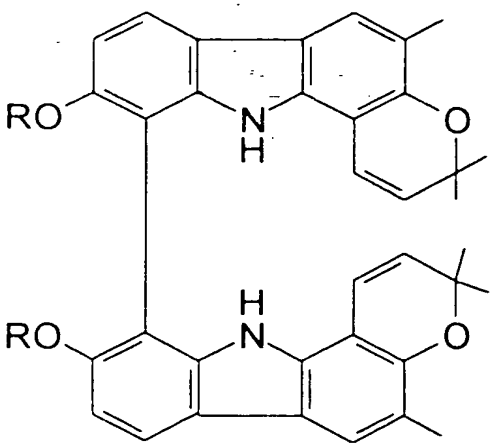
Paniculol



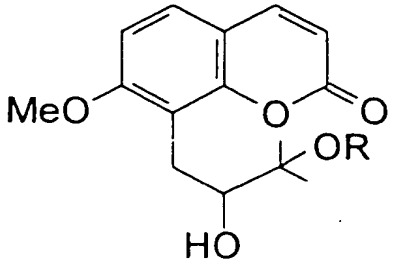
Murralonginol isovalerate
R = Isovaleryl



Isomurranginol isovalerate
R = Isovaleryl



Bis-7-hydroxygirinimbine A
R = H
Bis-7-methoxygirinimbine A
R = Me



Yuehgesin A
R = $C(Me_2)OH$
Yuehgesin B
R = Me
Yuehgesin C
R = Et

BIOLOGICAL ACTIVITY

Murralongin inhibited *Bacillus subtilis* (*Bull. Pharm. Sci., Assiut Univ.* 1988, *11*, 88; *Chem. Abstr.* 1990, *112*, 69484 j); osthol, aurapten, lupeol and 3-epicyclolaudenol showed marginal antimicrobial activity; osthol and aurapten also exhibited moderate cytotoxic effect (*Bull. Pharm. Sci., Assiut Univ.* 1988, *11*, 105; *Chem. Abstr.* 1990, *112*, 30295 y).

MUSA (Musaceae)

M. balbisiana Colla syn. *M. sapientum* sensu Hook.f., p.p. (non L.)

H. - Kela; Nep. - Bonkera; Khasi - Kait-dewsan; Manipur - Chungbi anguoba; Assam - Athia kol.

A new aliphatic compound isolated from seeds and characterised as n-octacosan-1-ol-22-one (*Orient. J. Chem.* 1991, *7*, 167; *Chem. Abstr.* 1992, *116*, 55570 e); isolation of three new diterpenoids - musabalbisianes A, B and C - from seeds and their characterisation (*Phytochemistry* 1992, *31*, 2173); a new sterol isolated from seeds and characterised as 25-methylcholest-1(2),7-dien-3-on-5α-ol (*Indian Drugs* 1992, *29*, 155).

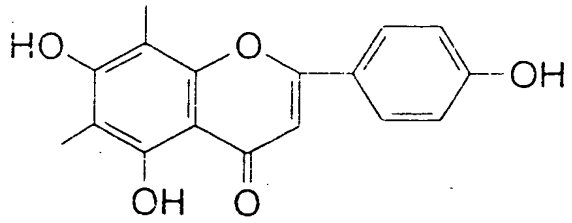
Distribution: Cultivated throughout India and Nepal.

SYZYGIUM (Myrtaceae)

S. alternifolium (Wight) Walp syn. *Eugenia alternifolia* Wight (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 705).

A new C-methylated flavone - syzalterin - isolated from leaves and its structure elucidated (*Indian J. Chem.* 1991, *30*B, 66).

NEW COMPOUNDS



Syzalterin

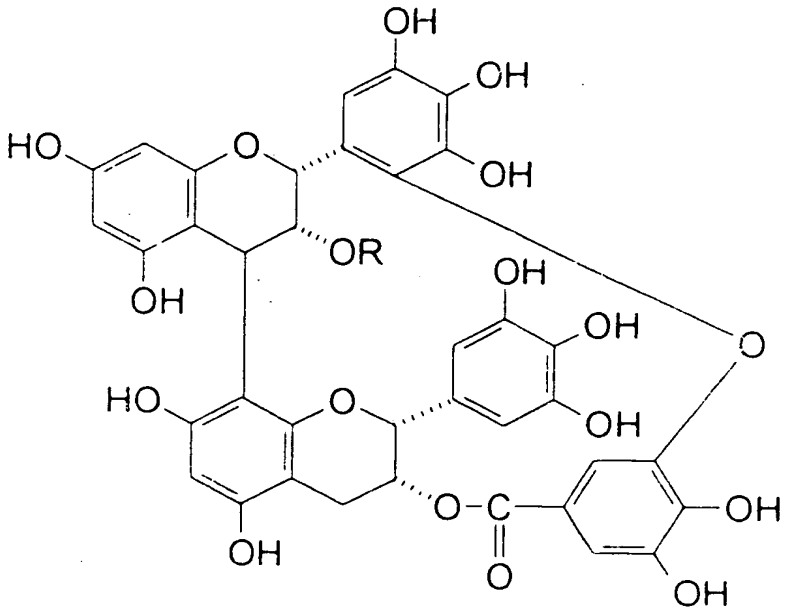
S. aqueum (Burm.f.) Alston syn. *Eugenia aquea* Brum.f.

Eng.- Watery rose apple; Tel. - Gulaabijaamichettu, Gulaabijamikaayalu; Khasi - Dieng-soh-liwa.

Two proanthocyanidins - samarangenins A and B - isolated from leaves and characterised (*Chem. Pharm. Bull.* 1992, *40*, 2671).

Distribution: Assam, Bengal and Meghalaya, ascending to 1300 m.

NEW COMPOUNDS



Samarangenin A
R = H
Samarangenin B
R = Galloyl

S. aromaticum (L.) Murr. & Perry syn. *Eugenia caryophyllata* Thunb., *E. caryophyllus* (Spreng.) Bullock & Harrison (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 705).

Extract leaves containing 3,4-dihydroxyphenethyl alcohol and 3,4-dihydroxybenzoic acid exhibited anti-inflammatory activity (CN 1,030,184 (1989) Jan. 11; *Chem. Abstr.* 1990, *113*, 29242 t).

β-Caryophyllene, its oxide, α-humulene, its epoxide and eugenol isolated (*J. Nat. Prod.* 1992, *55*, 999); eugenol-4-O-β-D-(6'-O-galloyl)-glucoside, 2-methyl-5,7-dihydroxychromone-8C-β-D-glucoside, its 6'-O-gallate, 2,4,6-trihydroxyacetophenone-3C-β-D-glucoside, its 2'-O-, 6'-O-, 2',3'-di-O-, 2',6'-di-O-, 2',3',6'-tri-O-, 2',3',4',6'-tetra-O-gallates and 2',3'-di-O-galloyl-4',6'-O-(S)-hexahydroxydiphenoyl ester isolated; in addition veloneic acid bislactone, gallic acid-3-O-β-D-(6'-O-galloyl)glucoside, 4-hydroxy-3-methoxyphenol-1-O-β-D-(6'-O-galloyl)-glucoside, 2,3-di-O-, 1,2,3,6-tetra-O-,1,2,3,4,6-penta-O-galloylglucose, strictinin, gemin D, eugeniin, 1-desgalloyl eugeniin, 1(β)-O-galloylpedunculagin, rugosin A, casuariin, pterocarinin A and rugosins E and D isolated (*Chem. Pharm. Bull.* 1993, *41*, 1232).

BIOLOGICAL ACTIVITY

β-Caryophyllene, its oxide, α-humulene, its epoxide and eugenol exhibited significant activity as inducers of detoxifying enzyme glutathione-S-transferase in mouse liver and small intestine. They inhibited chemical carcinogenesis and may find use as potential anticarcinogenic agents (*J. Nat. Prod.* 1992, *55*, 999).

S. cuminii (L.) Skeels syn. *Eugenia jambolana* Lam. (*Compend. Indian Med. Plants*, Vol. 2, Rastogi & Mehrotra, PID, New Delhi, 1991, p. 660).

Isolation of dihydromyricetin from leaves (Jpn. 1,175,932 (1989) Jul. 12; *Chem. Abstr.* 1990, *112*, 42558 z); isorhamnetin-3-O-rutinoside isolated (*J. Indian Chem. Soc.* 1990, *67*, 785); myrcene, β-pinene, α-terpinene, terpinolene, β-phellandrene, bornylene, cuminaldehyde, α-terpineol, eugenol and borneol identified in essential oil (*Indian Perfum.* 1991, *35*, 112; *Chem. Abstr.* 1991, *115*, 252104 m); a new flavonoid - myricetin-3-O-robinoside - isolated from roots along with myricetin-3-O-glucoside (*Fitoterapia* 1992, *63*, 259).

BIOLOGICAL ACTIVITY

Dihydromyricetin (0.16 μM) inhibited (34.4%) mutation in *Salmonella typhimurins* as compared to control (Jpn. 1,175,932 (1989) Jul. 12; *Chem. Abstr.* 1990, *112*, 42558 z).

S. operculatum (Roxb.) Niedenzu syn. *Cleistocalyx operculatus* (Roxb.) Merr. & Perry (*Glossary Indian Med. Plants*, Chopra, Nayar & Chopra, PID, New Delhi, 1956, p. 238).

2',4'-Dihydroxy-6'-methoxy-3',5'-dimethylchalcone, 5,7-dihydroxy-6,8-dimethylflavone, 7-hydroxy-5-methoxy-6,8-dimethylflavanone, ethyl gallate, gallic acid, ursolic acid, cinnamic acid and β-sitosterol isolated from flower buds (*Zhiwu Xuebao* 1990, *32*, 469; *Chem. Abstr.* 1991, *114*, 98203 p); arjunolic acid isolated from bark as antidermatophytosis constituent (*Shoyakugaku Zasshi* 1993, *47*, 408; *Chem. Abstr.* 1994, *121*, 42528 a).

S. samarangense (Bl.) Merr. & Perry syn. *Eugenia javanica* Lamk., p.p. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 706).

Two proanthocyanidins - samarangenins A and B - isolated from leaves and characterised (*Chem. Pharm. Bull.* 1992, *40,* 2671).

TABEBUIA (Bignoniaceae)

T. pentaphylla (L.) Hemsl. syn. *Tecoma pentaphylla* Juss. (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 706).

β-Lapachone synthesised (*J. Heterocycl. Chem.* 1992, *29,* 1457; *Chem. Abstr.* 1993, *118,* 124231 a).

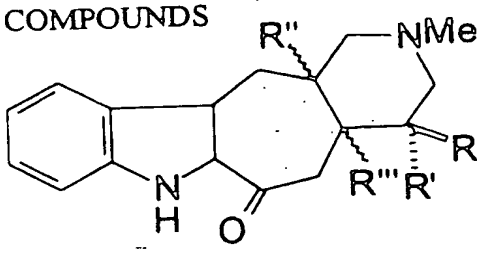
TABERNAEMONTANA (Apocynaceae)

T. coronaria R.Br.; see *T. divaricata* (L.) R.Br. ex R. & S.

T. divaricata (L.) R.Br. ex R. & S. syn. *T. coronaria* R.Br., *Ervatamia coronaria* Stapf, *E. divaricata* (L.) Alston (*Compend. Indian Med. Plants,* Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 707).

Isolation of janetine, hydroxyindolenine and voaphylline from flowers (*Rev. Cubana Farm.* 1989, *23,* 141; *Chem. Abstr.* 1990, *112,* 115817 v); indole alkaloids (I and II) isolated from whole plant and their structures determined (Jpn. 1,272,582 (1989) Oct. 31; *Chem. Abstr.* 1990, *112,* 185774 c); isolation of a new alkaloid - 11-methoxy-N-methyl-dihydropericyclivine - and its structure elucidation; in addition, voacangine, voacristine, isovoacristine, coronaridine, isovoacangine, 19-epivoacangine, vobasine and tabernaemontanine isolated (*Phytochemistry* 1991, *30,* 1740); a new alkaloid - voaharine - and a dimeric alkaloid - conophylline - isolated from leaves and their structures established by X-ray analysis (*Tetrahedron Lett.* 1992, *33,* 969; *J. Nat. Prod.* 1993, *56,* 1865); isolation of another new dimeric alkaloid - conophyllidine - from leaves; voacangine, apparicine, 19-epivoacristine, voacristine and its 7-hydroxyindolenene also isolated; crystal structure of new compound determined (*J. Nat. Prod.* 1993, *56,* 1865).

NEW COMPOUNDS

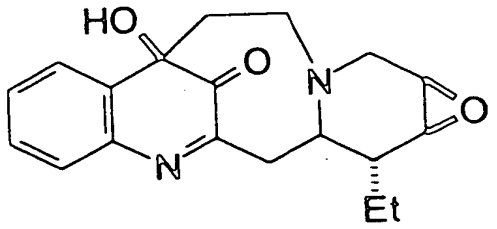


I

R = H, R' = Et, R'' = β-COOMe, R''' = β-H

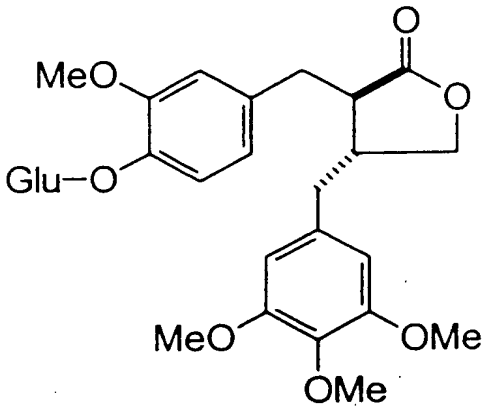
II

R = Et, R' = H, R'' = α or β-COOMe, R''' = α or β-OH



Voaharine

NEW COMPOUNDS



Traxillaside

T. gracilipes Hook.f.

Luteolin-7-O-glucoside and luteolin-4-O-glucoside besides 7-O-glucoside, 7-O-diglucoside, 7-O-neohesperidoside and 7-O-rutinoside of apigenin isolated (*Zhonghua Yaoxue Zazhi* 1992, *44*, 395; *Chem. Abstr.* 1993, *118*, 77097 z); tracheloside, arctiin and matairesinoside isolated (*Zhonghua Yaoxue Zazhi* 1993, *45*, 195; *Chem. Abstr.* 1993, *119*, 266441 p).

Distribution: Assam and Meghalaya.

BIOLOGICAL ACTIVITY

Arctiin exhibited potent anti-HIV activity (*Zhonghua Yaoxue Zazhi* 1993, *45*, 195; *Chem. Abstr.* 1993, *119*, 266441 p).

TRACHYCARPUS (Arecaceae)

T. excelsa Wendl.; see *T. fortunei* (Hook.) Wendl.

T. fortunei (Hook.) Wendl. syn. *T. excelsa* Wendl. (*excelsus*) (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 737).

A protein - TP-1 - isolated from inflorescence (*Zhiwu Shengli Xuebao* 1993, *19*, 167; *Chem. Abstr.* 1993, *119*, 245599 f).

Distribution: Native of Burma and China, grown in gardens in north-eastern India and elsewhere.

BIOLOGICAL ACTIVITY

Tp-1 at 1.0 mg/ml inhibited growth of mycelia of *Trichoderma viride* and also that of some crop fungal pathogens (*Zhiwu Shengli Xuebao* 1993, *19*, 167; *Chem. Abstr.* 1993, *119*, 245599 f).

TRACHYSPERMUM (Apiaceae)

T. ammi (L.) Sprague syn. *Carum copticum* Benth. & Hook. , *Trachyspermum copticum* (L.) Link (*Compend. Indian Med. Plants*, Vol. 4, Rastogi & Mehrotra, PID, New Delhi, 1995, p. 737).

Thymol (61.0), p-cymene (15.6) and γ-terpinene (11.9%) determined in fruit essential oil from Turkish plant (*J. Essent. Oil Res.* 1993, *5*, 105; *Chem. Abstr.* 1993, *118*, 219433 g).

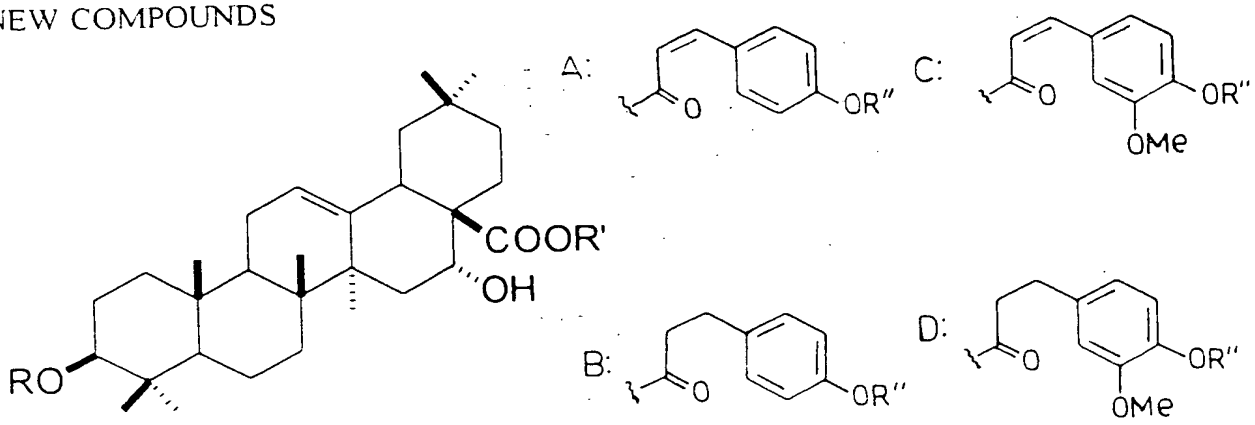
T. copticum (L.) Link: see *T. ammi* (L.) Sprague

TRAGOPOGON (Asteraceae)

T. porrifolius L. (*porrifolium*) (*Glossary Indian Med. Plants*, Chopra, Nayar & Chopra, PID, New Delhi, 1956, p. 246).

Eighteen new triterpenoid saponins - tragopogon saponins A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q and R - isolated and their structures established *Chem. Pharm. Bull.* 1991, *39*, 388).

NEW COMPOUNDS

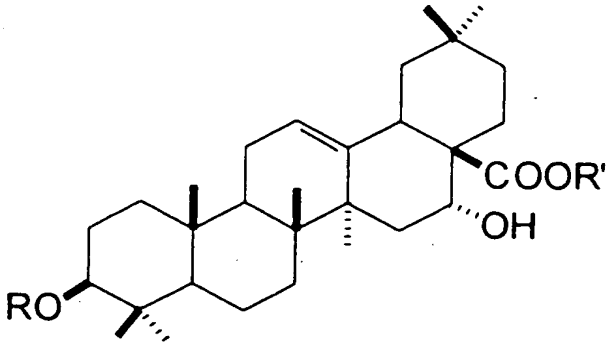


Name	R	R'	R''
Tragopogon saponin A	Gluc.acid	H	-
Tragopogon saponin B	Gluc.acid	Xyl(2—A)	H
Tragopogon saponin C	Gluc.acid	Xyl(2—C)	H
Tragopogon saponin D	Gluc.acid	Xyl(2—C)	Glu
Tragopogon saponin E	Gluc.acid	Ara(2—C)	Glu
Tragopogon saponin F	Gluc.acid	Xyl(2—A)(3→1)Glu	H
Tragopogon saponin G	Gluc.acid	Xyl(2—B)(3→1)Glu	H
Tragopogon saponin H	Gluc.acid	Ara(2—A)(3→1)Glu	H
Tragopogon saponin I	Gluc.acid	Ara(2—B)(3→1)Glu	H
Tragopogon saponin J	Gluc.acid	Ara(2—D)(3→1)Glu	H
Tragopogon saponin K	H	Ara(2—A)(3→1)Glu	H
Tragopogon saponin L	H	Ara(2—B)(3→1)Glu	H
Tragopogon saponin M	H	Ara(2—D)(3→1)Glu	H
Tragopogon saponin N	Gluc.acid	Xyl(2—A)(3→1)Glu	Glu
Tragopogon saponin O	Gluc.acid	Xyl(2—B)(3→1)Glu	Glu
Tragopogon saponin P	Gluc.acid	Ara(2—B)(3→1)Glu	Glu
Tragopogon saponin Q	H	Ara(2—A)(3→1)Glu	Glu
Tragopogon saponin R	Gluc.acid	Ara(2—D)(3→1)Glu	Glu

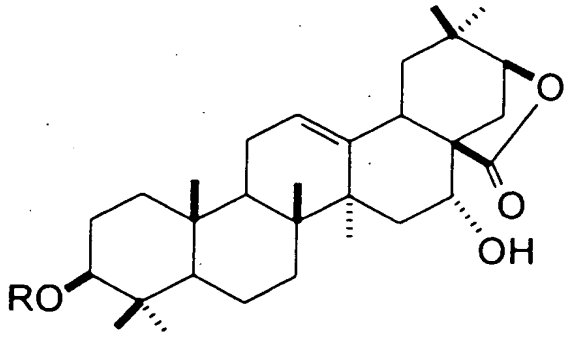
T. pratensis L. (*pratense*) (*Glossary Indian Med. Plants,* Chopra, Nayar & Chopra, PID, New Delhi, 1956, p. 246).

Nine oleanane saponins - tragopogonosides A, B, C, D, E, F, G, H and I - isolated from whole plant and their structures elucidated (*Phytochemistry* 1992, *31,* 2087).

NEW COMPOUNDS



Name	R	R'
Tragopogonoside A	Gluc.acid	Xyl
Tragopogonoside B	Gluc.acid(2→1)Gal	H
Tragopogonoside C	Gluc.acid(2→1)Gal	Xyl
Tragopogonoside D	Gluc.acid	Xyl(3→1)Glu
Tragopogonoside E	Gluc.acid(2→1)Gal	Xyl(3→1)Glu
Tragopogonoside F	Gluc.acid(2→1)Gal	Xyl[(2-p-coumaroyl)](3→1)Glu
Tragopogonoside G	Gluc.acid(2→1)Gal	Xyl(2-p-coumaroyl)
Tragopogonoside H	Gluc.acid(2→1)Gal	Xyl(2-feruloyl)



Tragopogonoside I
R = Gluc.acid(2→1)Gal

TREMA (Ulmaceae)

T. cannabina Lour. syn. *T. timorensis* (Decne.) Blume, *T. virgata* (Roxb.) Blume (*Compend. Indian Med. Plants,* Vol. 3, Rastogi & Mehrotra, PID, New Delhi, 1993, p. 653).